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THE GYPSY MOTH, LYMANTRIA DISPAR (L.)

(LEPIDOPTERA: LYMANTRIIDAE)[1]

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INTRODUCTION: The gypsy moth, Lymantria dispar (L.), was brought from Europe to the United States in the spring of 1869 by Leopold Trovelot, a naturalist, for the purpose of producing a commercial source of silk (Forbush and Fernald 1896). Later that year, insects escaped from the cages in his house in Medford, Massachusetts and since 1889, the first notable outbreak, the gypsy moth has had the public's attention (Gerardi and Grimm 1979). Gypsy moth outbreaks are still limited principally to northeastern and middle Atlantic states (Anonymous 1984); however, the southward expansion of this naturalized pest continues. It is a defoliator of over 500 species of trees, shrubs, and vines (McManus 1980). In Florida, potential damage is high to forests composed primarily of oaks and other favored tree species, particularly in portions of the panhandle and the central sand ridge of the peninsula.

DESCRIPTION: Described by Linnaeus in 1758 in the 10th edition of Systema Naturae Vol. I, p. 501 as Phaloena (Bombyx) dispar-- the name "dispar" denoting the disparate or marked differences between adult males and females. Adult male (Fig. 1) antennae pectinate, light brown; body slender, dark brown; wings light to dark brown with black markings: blackish, wavy bands on forewings with arrowhead markings near anal edge, wingspan 2.5-3.8 cm. Adult female (Fig. 1) antennae pectinate, but narrower than male; body stout, cylindrical with yellow hairs; wings white or grayish-white with black markings: brown or blackish bands and arrowhead markings on forewings, a marginal transverse line of dark-colored dots on outer edge of fore and hind wings. Egg globular, small (1.10-1.25 mm diameter), and white or transparent. Egg mass or clump (Fig. 2) oval, raised in center, covered with buff-colored hairs (from female's abdomen and sides), appearance similar to chamois cloth or sponge, 1.3-5.1 cm long. Mature larva (Fig. 3) length 37-60 mm; head with yellow markings; body with dusky or slate colors, peppered with numerous small dark spots, 3 light stripes along back, 5 pairs of blue spots followed by 6 pairs of brick-red spots on segments 2-12, general ventral surface light grayish-brown; 1st instar ca. 3 mm long, extremely hairy and dark. Pupa (Fig. 4) reddish-brown; few short light brown or red hairs around spiracles and across thoracic and abdominal segments; length 1.9-2.5 cm; loosely attached to objects with a few strands of silk (Baker 1972; Gerardi and Grimm 1979).

DISTRIBUTION: Largest area of periodic outbreak in Europe and Asia occurs between 0-50°E longitude and 40-55°N latitude with recorded incidences from latitude 20°N to 60°N (Giese and Schneider 1979). (For comparison, Florida's geographic location is 80-88° W longitude and 25-30°N latitude). In 1983, gypsy moth defoliation was observed in CA, CT, DL, IL, IN, ME, MD, MA, MI, MN, NC, NH, NJ, NY, OH, OR, PA, RI, SC, VI, VT, WA, WI (Anonymous 1984). Only one infestation has been documented in Florida: a trailer park in Pensacola in 1971.

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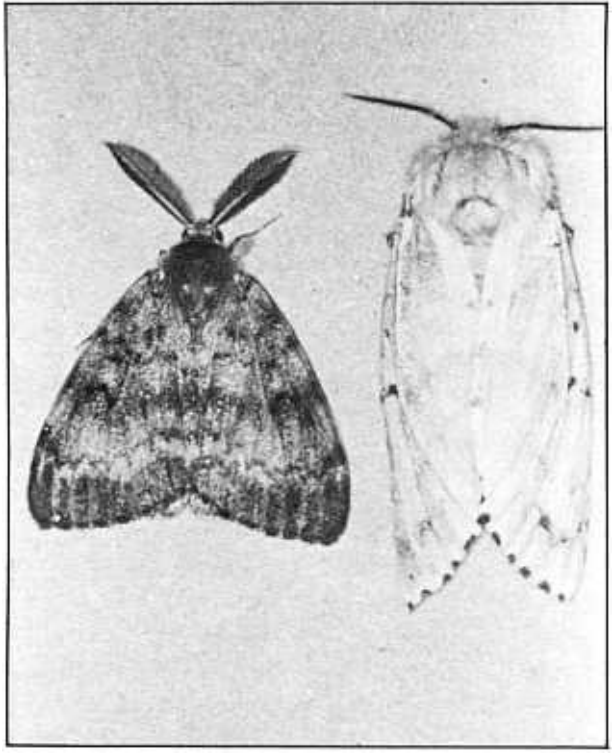

Fig. 1. Adult male and female gypsy moths. (DPI Neg. No. 850017-18A; color slide courtesy of Noel Schneeberger, USFS)

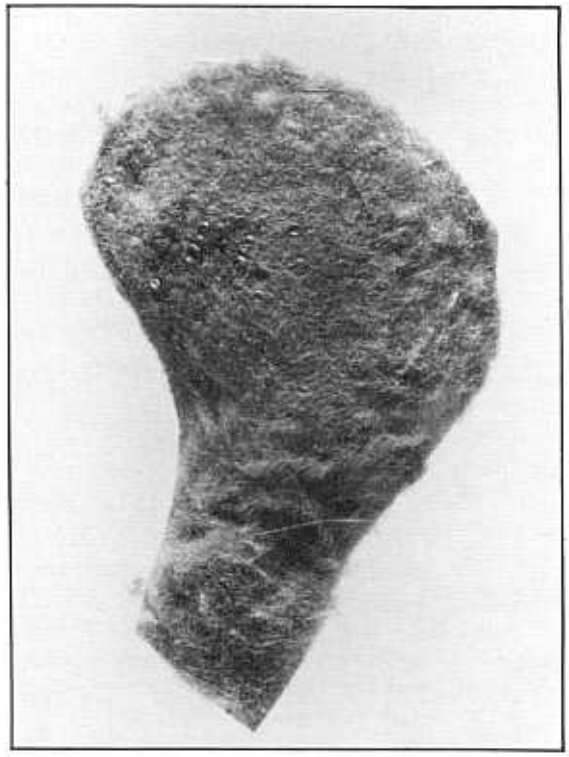

Fig. 2. Egg mass or clump of gypsy moth. (DPI Neg. No. 703074-7; photo credit, J. Lotz)

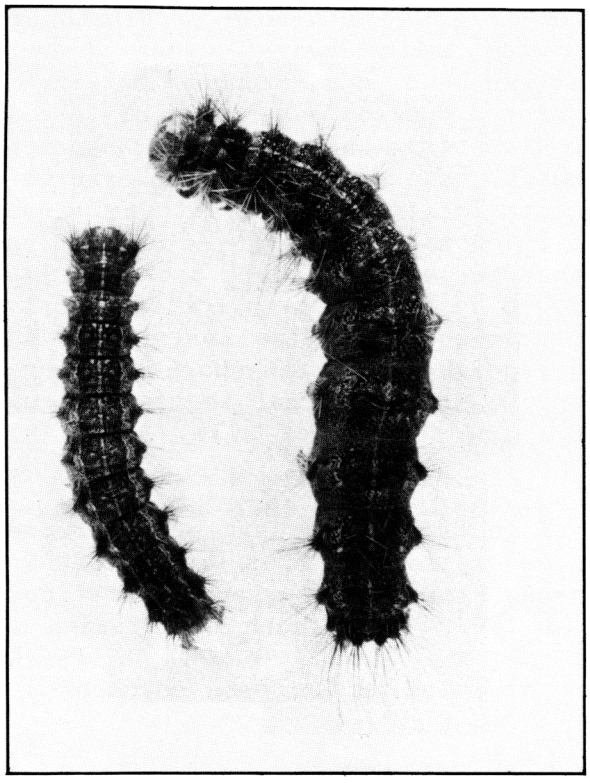

Fig. 3. Male (5th instar) and female (6th instar) larvae of gypsy moth. (DPI Neg. No. 703074-8; photo credit, J. Lotz)

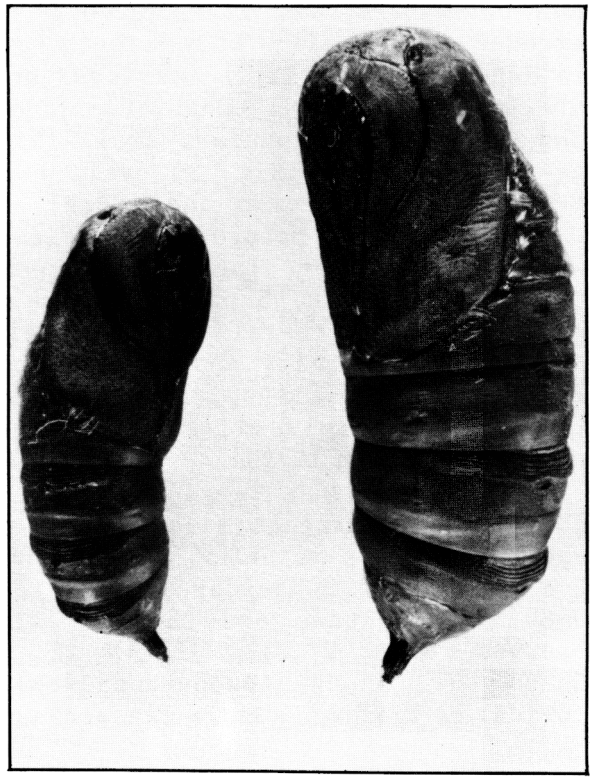

Fig. 4. Male and female pupae of gypsy moth. (DPI Neg. No. 703074-11; photo credit, J. Lotz)

HOSTS: Favored plants include oaks (Quercus spp.), apples (Malus spp.), birches (Betula spp.), poplars (Populus spp.), willows (Salix spp.), basswoods (Tilia spp.), hawthorns (Crataegus spp.), and sweetgum (Liquidambar styraciflua L.), (McManus 1980). Feeding tests suggest that the following Florida species may allow successful caterpillar development: laurel oak (Quercus laurifolia Michx.), live oak (Q. virginiana Mill.), sycamore (Platanus occidentalis L.), southern red cedar (Juniperus silicicola (Small) Bailey), slash pine (Pinus elliottii Engelm.), loblolly pine (P. taeda L.), longleaf pine (P. palustris Mill.), and sand pine (P. clausa (Champm.) Vasey) (Dixon and Mastro, unpublished data); black oak (Q. velutina Lam.), willow oak (Q. phellos L.), white oak (Q. alba L.), red maple (Acer rubrum L.) (Barbosa et al. 1983; foliage from Maryland). Moderately defoliated trees are subject to loss of growth and appearance. Severe defoliation may cause death: 1 year of defoliation may kill conifers, 2-3 years may kill hardwoods. Dominant trees are degraded less than subdominant trees and are less likely to die. Severely defoliated trees risk infestation by other insect species and/or disease. Forest stand composition generally changes after a gypsy moth outbreak (Campbell and Sloan 1977; Campbell 1979). Whether these changes would be good or bad in Florida is unknown.

BIOLOGY: In the northeastern United States, moths emerge from late July to early August. Female moths emit a chemical (a pheromone) from glands to attract male moths for mating, and then oviposit eggs. The female does not fly, even though she has large wings. Egg masses or clumps are usually found near empty pupal cases of females. Eggs are placed in dark sheltered areas, e.g., bark crevices, under loose bark, and the undersides of limbs, rocks, stumps, leaf litter, vehicles, and outdoor household equipment. Each egg mass may contain from 100-1,000 eggs. Larvae form in eggs within 1 month, but activity ceases during overwintering diapause. Increasing heat in the spring, plus other stimuli, prompts egg hatch. Newly emerged 1st instar larvae disperse by climbing to the top of vegetation or structures and then ballooning away on a long spun strand of silk. Young larvae prefer to eat newly flushed foliage or the leaves of trees under stress. Most feeding occurs during daylight hours; at night the young larvae lie in silk mats spun on leaf undersides. By the 3rd instar, larvae feed at night and take cover under loose bark or in leaf litter during daylight hours. Generally, male larvae have 5 instars, females 6, but more may occur. The larval stage may last from 20-60 days. Pupation occurs in secluded sites and lasts 14-17 days. Adult moths emerge and renew the cycle. There is only 1 generation per year (Leonard 1981; McManus 1980). In the Northeast, the most susceptible forests occur on dry ridges and steep upper slopes with shallow soils and on deep excessively drained sands where growth is slowed or stopped (Houston 1979). Leaves from weakened or stressed trees have higher concentrations of nutrients, and larval mortality is lower on drought-stricken trees (Leonard 1974).

CONTROL: A federal domestic quarantine and special control efforts are in effect for the gypsy moth:

1. Interstate movement of nursery stock, timber products, and firewood is restricted; these items must be certified as pest-free.
2. All outdoor household items moved from high risk areas into or through non-regulated areas must be certified as free of any gypsy moth life stages.
3. Infested campgrounds and parks are sprayed with insecticides to reduce risk of pest transportation on recreational equipment or vehicles.
4. Remote infestations detected outside the infested area are eliminated or suppressed to undetectable levels with insecticides (McManus 1980; Anonymous 1983).

Several insecticides including biological (bacterial, viral), synthetic hormone (insect growth regulator), and toxic chemicals (nervous system disrupters) are available and used to suppress or eradicate gypsy moth populations. Due to changing

USDA, APHIS-PPQ and EPA regulations, the reader is advised to contact a local or state regulatory agency for current information on gypsy moth control. Other available methods include release of natural enemies (wasps) and physical barriers (larval band traps). Any suspect insect specimens should be forwarded to the Bureau of Entomology, Division of Plant Industry, for identification.

SURVEY AND DETECTION: Pheromone traps are the primary tools used for detection of gypsy moth populations. Traps are triangular shaped, constructed of waxed cardboard, open at both ends, covered inside with a sticky substance, and baited with "dispalure", a synthetic sex attractant to lure male moths into the trap. Visual surveys are conducted for gypsy moth egg masses or signs of defoliation where warranted. Gypsy moth males, larvae, pupae, and eggs have been found in Florida. Although gypsy moth eggs will hatch under Florida environmental conditions (Dixon and Mastro, unpublished data), the likelihood of a gypsy moth problem in the near future is unknown.

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